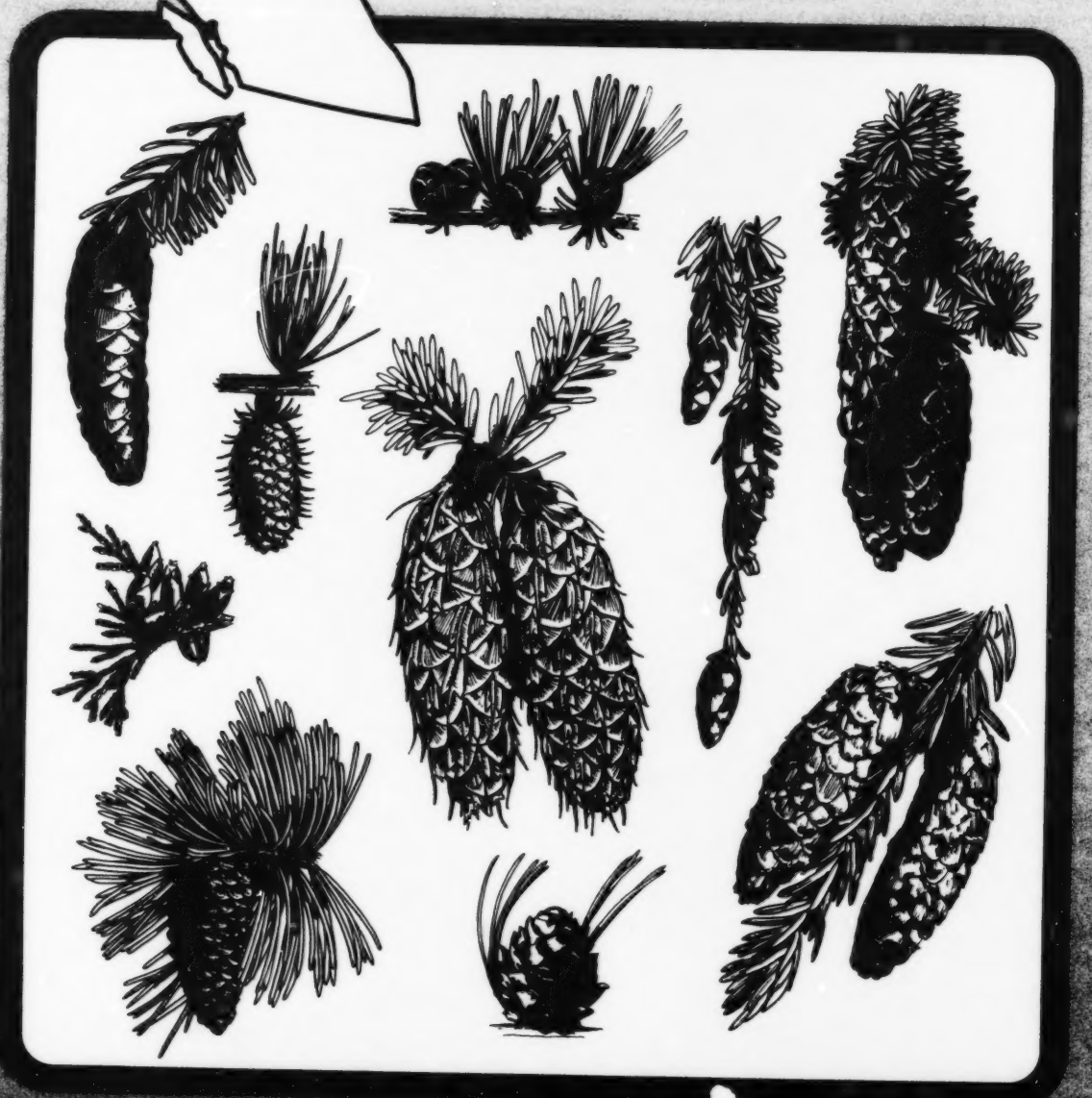
1733

1976 CONE CROP BULLETIN

BRITISH COLUMBIA / YUKON TERRITORY



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Introduction

A large-scale reforestation program, such as in B.C., requires the collection, processing, storage and use of hundreds of tree seed provenances separated by species, and zone and elevation of origin. There is a need to continually replace seed which has been used or which has lost viability. The opportunity to do so, however, arises at infrequent and unpredictable intervals, since crops often fail to get started or to develop fully due to adverse weather or attack by insects or disease. When a satisfactory crop does mature, the cones must be collected usually within 2-to-3 weeks by large numbers of cone pickers. Under such circumstances, a successful harvest depends on advance planning and pre-organization which, in turn, depends on accurate and timely information on developing cone crops. Information on seed crop potential is also required by the silviculturist as a basis for preparing seedbeds for natural regeneration.

The annual CONE CROP BULLETIN for British Columbia and the Yukon Territory, of which this is the first issue, is a focus for systematic rating of cone crops, as well as a comprehensive report on developing crops enabling forest managers and tree seed dealers to plan and mobilize collection operations or seedbed preparation. It also provides information for researchers or others studying cone-crop periodicity. The bulletin is prepared jointly by the Canadian Forestry Service and the B.C. Forest Service, in cooperation with the Yukon Lands and Forest Service and the forest industry; compilers are R.C. Dobbs (CFS) and J. Konishi (BCFS). Agencies contributing data to this issue are listed on page 9.

Forest Tree Seed Inventory for B.C.

About 19 650 kg of seed for the provincial reforestation program are in storage at the Duncan Seed Centre. This represents a potential of over 2 billion seedlings--enough to sustain the program at its present level for about 25 years. But the reforestation program is not remaining "at its present level"--each year several million more seedlings are needed than the year before. Moreover, direct seeding may play a much greater role in the future, and this requires about 5 times as much seed to reforest a given area.

There is a continuing need to upgrade the quality of stored tree seed. Numerous seedlots are of poor or questionable genetic quality; many others are over 10 years old, and are losing viability with each passing year. Inventory totals also conceal serious shortages of several much-needed species and provenances.

Currently, the most critical problem is the shortage of high-elevation provenances of Douglas-fir and western hemlock on the Coast, and of white and Engelmann spruce in the Interior. These shortages are due to a long "drought" of cone crops at a time when timber harvesting at higher elevations is accelerating. Foresters must be particularly alert to opportunities for reducing these shortages.

The picture that emerges, therefore, is not one of "tonnes of stored seed", but of current and prospective shortages that can be alleviated or forestalled only by concentrated and coordinated effort on the part of the Forest Service and forest industry.

Explanation of Cone Crop Ratings

Cone crop ratings are based on visual observations of tree crowns and subjective determinations of cone abundance. In any given stand, a rating is assigned according to the criteria in the following table.

Crop Rating	Criteria
1 - no crop	No cones on seed trees*
2 - very light	Few cones on less than 25% of seed trees
3 - light	Few cones on more than 25% of seed trees
4 - medium	Many cones on 25-50% of seed trees
5 - heavy	Many cones on more than 50% of seed trees

* Seed trees are upper story (dominant and co-dominant) trees.

"Few cones" and "many cones" are subjective determinations based on species and the experience of the observer.

Ratings for wild stands in B.C. are presented on the following pages by tree seed region and, within regions, by seed zone, elevation and species. Ratings for managed seed orchards are shown separately. A verbal summary follows the tabular data for each seed region. The limited number of ratings available for the Yukon Territory are presented in a single table by species and ecoregion. (Seed zones have not yet been delineated for the Yukon.) Maps of B.C. forest tree seed regions and zones and Yukon ecoregions are presented on pages 6 and 7.

In the tables, seed zone ratings are presented sequentially by rows. Ratings for species are shown in columns which are sub-divided by elevational bands coded as follows:

Code	Elevational Range
1	0-300 m (0-985 ft)
2	301-600 m (985-1970 ft)
3	601-900 m (1970-2955 ft)
4	901-1200 m (2955-3940 ft)
5	1201-1500 m (3940-4920 ft)
6	1501-1800 m (4920-5905 ft)
7	above 1800 m (above 5905 ft)

The tabular data are averages of all rating reports received for the indicated seed zone, species and elevation band. The number in brackets appearing above each rating indicates the number of reports on which the average is based.

Rating reports are generally based on trees along roadsides or other stand edges. Observations are usually made from the ground, although helicopters are used in some cases. The practice of basing ratings on edge trees probably over-estimates the cone crop for a stand or area because edge trees tend to produce more cones because of their greater exposure to sunlight. It was decided to use such trees for the ratings in this bulletin because 1) their visibility affords more accurate estimates, and 2) these are usually the trees from which cones are collected, and from which seed for natural regeneration originates.

A FINAL WORD OF CAUTION: The ratings in this bulletin apply to cone crops, not necessarily to seed crops. Experienced cone collectors are well aware that insects and other problems may reduce a promising cone crop to a disappointing seed crop. The quantity and quality of seed must be determined by collection supervisors prior to cone collection. For seed crop evaluation procedures and other information on collecting cones, see "Guideline to Collecting Cones of B.C. Conifers" (British Columbia Forest Service/Canadian Forestry Service, Joint Report No. 3. March, 1976).

Cone Crop Ratings

1000 WEST COAST

	Douglas-fir			Western hemlock			Mountain hemlock		Western red cedar			Yellow cedar		Sitka spruce		Amabilis fir			Grand fir
Elevation Code (see p. 3)	1	2	3	1	2	3	3	4	1	2	3	3	4	1	2	2	3	4	1
Seed Zone																			
1010	(8) 3.6	(12) 3.1	(2) 2.0	(9) 3.3	(14) 3.2	(1) 3.0			(2) 3.0	(6) 3.8	(1) 4.0		(1) 3.0	(3) 3.3		(10) 3.2			
1020	(18) 3.4	(30) 3.4	(10) 2.9	(2) 3.5	(9) 2.1	(15) 3.1	(2) 4.0	(3) 3.2	(2) 2.5	(4) 2.2		(1) 2.0	(1) 3.0		(1) 5.0	(5) 2.6	(6) 2.8	(1) 3.5	(4) 4.5
1040	(16) 3.6	(8) 3.0	(4) 3.5	(1) 3.0	(3) 2.0	(7) 4.7		(2) 4.5	(4) 2.3	(4) 2.5	(4) 4.5			(1) 4.0			(8) 3.6	(2) 4.0	
1050		(2) 3.0	(9) 3.2		(3) 1.7	(7) 2.3		(1) 5.0		(3) 1.7	(7) 2.1	(2) 1.5	(2) 1.0			(1) 2.0	(4) 2.3	(2) 2.5	
1070	(5) 2.4	(3) 2.7	(4) 2.8		(1) 4.0					(2) 4.0	(1) 4.0		(1) 2.0						
1080	(2) 4.0	(2) 3.0	(1) 4.0	(1) 4.0		(1) 4.0										(2) 3.0	(1) 4.0		
1110														(4) 3.5		Interior spruce			
1130				(4) 2.8	(2) 2.5									(1) 1.0	(1) 2.0	1	3	4	
1140				(7) 2.1		(4) 1.0								(5) 2.8	(3) 2.0	(4) 1.8	(3) 1.3	(2) 2.0	

N.B. A few ratings are omitted from the above table to maintain necessary compactness. None of these omissions are judged consequential.

Summary: The prospective Douglas-fir cone crop appears promising in zones 1010, 1020, 1040 and 1050. Reports of potentially collectable crops from 0-600 metres are too numerous to list. Potentially collectable crops above 600 metres were reported in the following areas: Northwest Bay, Blk. 142 (zone 1020, elev. 640 m); Mt. Elphinstone (zone 1040, elev. 760-880 m); McNab and Sechelt Creeks (zone 1040; elev. 750 m); Diamond Head (zone 1050, elev. 640-950 m); Fitzsimmons Creek (zone 1050, elev. 700 m); Furry Creek (zone 1050, elev. 610 m); Brohm Ridge (zone 1050, elev. 640 m); and T.F.L. 10, East Fork (zone 1080, elev. 760 m). The prospective western hemlock crop also appears promising in most areas, with numerous collectable crops reported up to 900 metres. Heavy crops (rating 5) were reported in the following areas: Canton Creek (zone 1010, elev. 30 m); Northwest Bay, Blk. 1324 (zone 1020, elev. 650 m); Mt. Elphinstone (zone 1040, elev. 550-800 m); Gray Creek (zone 1040, elev. 610-880 m); and Furry Creek (zone 1050, elev. 610 m). Potentially collectable mountain hemlock crops were reported in the following areas; Northwest Bay, Blk, 1324 (zone 1020, elev. 790 m); Mt. Elphinstone (zone 1040, elev. 1040-1100 m); Gray Creek (zone 1040, elev. 910-950 m); and Brohm Ridge (zone 1050, elev. 1370 m). Several collectable crops of western red cedar were reported in zones 1010 and 1040; no collectable yellow cedar crops were reported. Only a few reports on the Sitka spruce crop were received, but several of these indicated collectable crops; a heavy crop was reported in the Eve River area (zone 1020, elev. 310 m). The amabilis fir crop appears generally light, although several collectable crops were reported in zone 1040; a good grand fir crop is indicated in zone 1020. The interior spruce crop in zone 1140 appears nil to very light. No reports were received for zones 1030, 1060, 1090, 1100, 1120, 1150 or 1160.

2000 SOUTHERN DRY

Elevation Code (see p. 3)	Douglas-fir					Interior spruce			Lodgepole pine			Ponderosa pine			Western larch			Alpine fir
	2	3	4	5	6	4	5	6	4	5	6	2	3	4	3	4	5	6
Seed Zone																		
2020			(2) 1.5	(2) 3.0	(1) 2.0		(6) 2.5	(2) 2.0		(1) 2.0	(2) 4.0		(1) 2.0	(1) 2.0				
2030				(1) 2.0		(2) 4.5	(6) 2.7	(2) 2.0				(1) 4.0	(3) 2.3		(1) 5.0	(3) 1.7	(2) 2.5	
2040		(1) 2.0	(2) 1.5	(3) 2.0		(2) 4.5	(5) 2.8	(1) 4.0	(1) 4.0	(1) 2.0				(3) 2.0				(1) 4.0
2050	(3) 3.0		(4) 3.0	(2) 1.5					(2) 3.5			(2) 5.0		(1) 3.0				
2060	(1) 3.0		(1) 3.0	(1) 1.0			(1) 1.0	(1) 2.0										

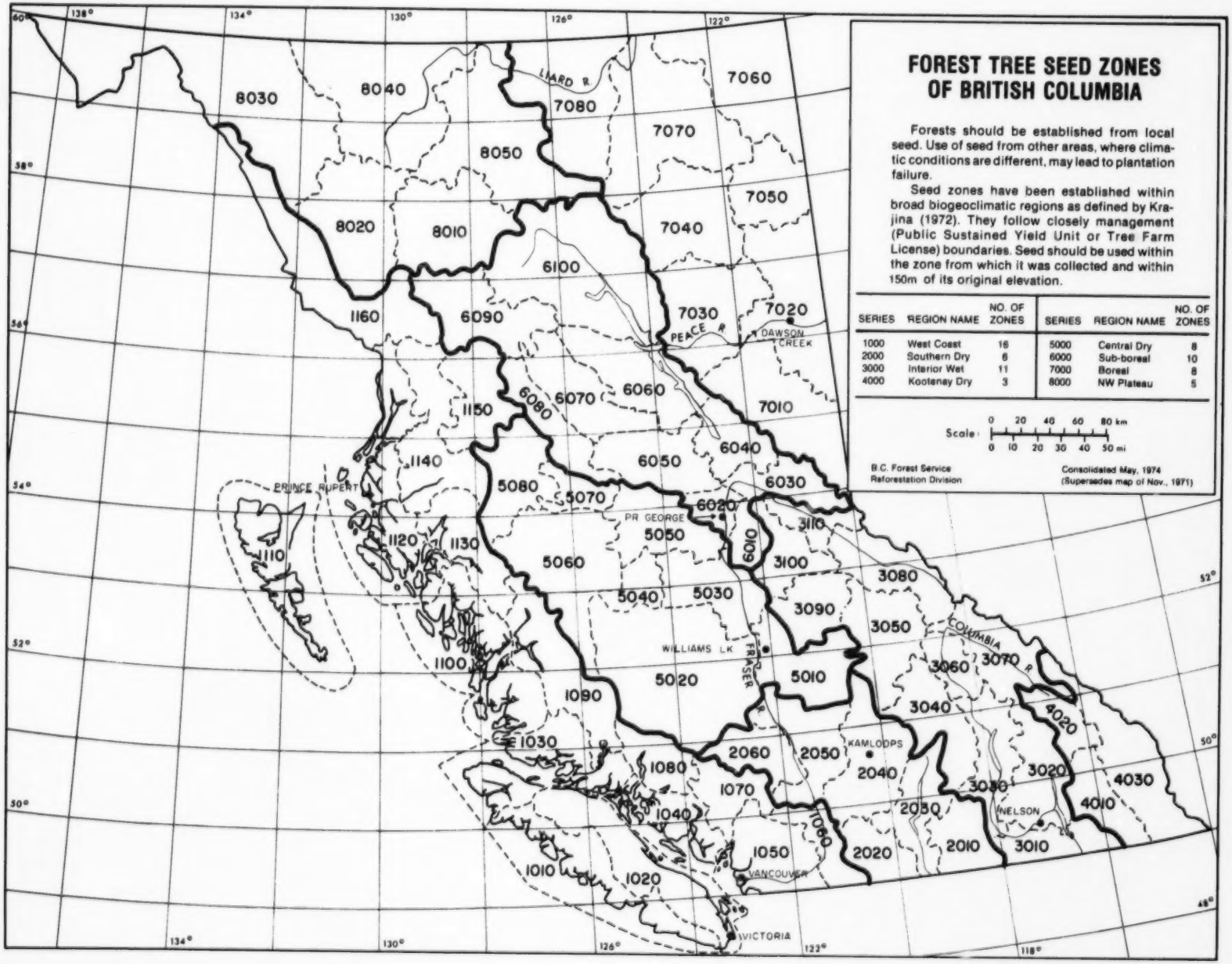
Summary: The prospective cone crop on important conifers in the Southern Dry region is generally nil to light, although rating reports suggest some important exceptions. Potentially collectable crops (rating 4 or 5) of Engelmann spruce were reported in the following areas: Britton Creek (zone 2020, elev. 1310 m); 4.5 km southeast of Enderby (zone 2030, elev. 1070 m); Little White Road (zone 2030, elev. 1220-1370 m); Bear Creek (zone 2030, elev. 1070-1220 m); Scuitto Lake (zone 2040, elev. 1070 m); McGillivary Lake (zone 2040, elev. 1590 m); and Knouff and Sullivan Lakes (zone 2040, elev. 1070 1220 m). Potentially collectable ponderosa pine crops were reported in the following areas: June Springs (zone 2030, elev. 610 m); O.K. Falls (zone 2030, elev. 460 m); near Lytton (zone 2050, elev. 300-460 m); and Sitwall Creek (zone 2050, elev. 370-460 m). A heavy crop of western larch was reported on T.F.L. 15, C.P. 1 (zone 2030, elev. 610 m). No collectable Douglas-fir crops were reported.

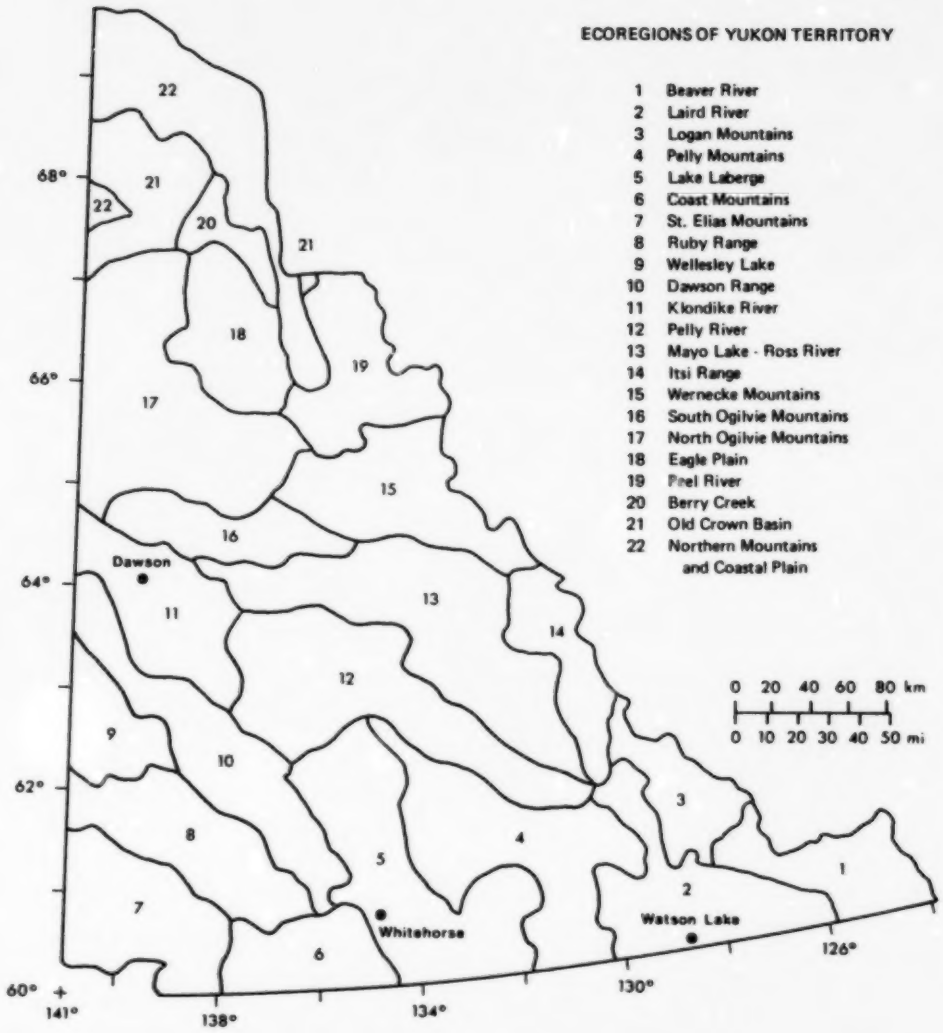
3000 INTERIOR WET

Elevation Code (see p. 3)	Douglas-fir				Interior spruce				Alpine fir			Western hemlock		Western larch		Lodge-pole pine	White pine
	2	3	4	5	3	4	5	6	4	5	6	3	5	3	4	4	4
Seed Zone																	
3010			(1) 3.0			(1) 3.0	(2) 4.5	(2) 4.5									
3020	(1) 2.0		(3) 1.0				(2) 3.0	(1) 4.0									
3030		(1) 3.0	(1) 3.0	(2) 2.5	(1) 3.0	(3) 3.7	(5) 3.6						(1) 4.0				
3040	(1) 2.0	(3) 2.7	(9) 2.2			(1) 2.0	(8) 3.1	(5) 1.8		(2) 2.0	(2) 1.5			(1) 1.0	(2) 1.0		(2) 3.0
3050		(2) 2.0	(2) 3.0			(1) 5.0	(2) 3.5		(1) 5.0	(1) 5.0		(1) 4.0					
3090		(2) 4.0	(3) 4.0	(1) 4.0	(1) 4.0	(12) 3.0	(3) 2.7									(2) 3.5	
3100					(1) 3.0	(8) 3.1	(1) 3.0									(1) 3.0	

Summary: The prospective cone crop in the Interior Wet region is highly variable; rating reports for major species have indicated crops ranging from nil to heavy. Collectable crops (rating 4 or better of Douglas-fir were reported in the following areas: White Lake (zone 3040, elev. 820 m) Candle Creek (zone 3050, elev. 920 m); Clearbrook Creek (zone 3090, elev. 920 m); Spanish Mountain (zone 3090; elev. 1220-1370 m); Antoine Lake (zone 3090; elev. 920 m); and north of Beaver Creek (zone 3090; elev. 850 m). Reports of collectable crops of interior spruce are too numerous to list completely; heavy crops (rating 5) were reported in the following areas: Maryland Creek (zone 3010, elev. 1680-1830 m); Goose Creek (zone 3010, elev. 1220-1520 m); and Finn Creek (zone 3050, elev. 1070-1430 m). A heavy alpine fir crop was also reported in the Finn Creek area. Medium crops of western hemlock were reported in the areas of Mt. MacPherson (zone 3030, elev. 1160-1280 m) and Finn Creek (zone 3050, elev. 850 m). No reports were received for zones 3060, 3070 or 3080.

(continued on page 8)


FOREST TREE SEED ZONES OF BRITISH COLUMBIA
Forests should be established from local seed. Use of seed from other areas, where climatic conditions are different, may lead to plantation failure.
Seed zones have been established within broad biogeoclimatic regions as defined by Krajina (1972). They follow closely management (Public Sustained Yield Unit or Tree Farm License) boundaries. Seed should be used within the zone from which it was collected and within 150m of its original elevation.
SERIES | REGION NAME | NO. OF ZONES
1000 West Coast 16
2000 Southern Dry 6
3000 Interior Wet 11
4000 Kootenay Dry 3
5000 Central Dry 8
6000 Sub-boreal 10
7000 Boreal 8
8000 NW Plateau 5
Scale: 0 20 40 60 80 km
0 10 20 30 40 50 mi
B.C. Forest Service
Reforestation Division
Consolidated May, 1974
(Supersedes map of Nov., 1971)
8030
8040
8050
8020
8010
7080
7070
7060
7050
7040
7030
7020
7010
6100
6090
6080
6070
6060
6050
6040
6030
6020
6010
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
5080
5070
5060
5050
5040
5030
5020
5010
3110
3100
3090
3080
3070
3060
3050
3040
3030
3020
3010
2060
2050
2040
2030
2020
2010
4030
4020
4010
PEACE R.
DAWSON CREEK
LIARD R.
PRINCE RUPERT
PR GEORGE
WILLIAMS LK
FRASER R.
COLUMBIA R.
KAMLOOPS
NELSON
VANCOUVER
VICTORIA
60°
58°
56°
54°
52°
50°
48°
138°
134°
130°
126°
122°
118°



Yukon Territory cone crop reports are based on the ecoregions shown above pending the establishment of forest tree seed zones.

4000 KOOTENAY DRY

Summary: Few reports were received for the Kootenay Dry region. Generally, it appears that cone crops on important conifers are very light. A potentially collectable crop of Engelmann spruce was reported in the Dewar Creek area (zone 4010, elev. 1370-1520 m).

5000 CENTRAL DRY

	Douglas-fir				Interior spruce			Lodgepole pine		
Elevation Code (see p. 3)	2	3	4	5	3	4	5	3	4	5
Seed Zone										
5010	(1) 4.0	(1) 4.0	(4) 3.8	(1) 3.0		(1) 4.0	(1) 3.0		(1) 4.0	(2) 4.0
5020	(1) 3.0	(2) 4.0	(6) 4.0							(1) 4.0
5030	(1) 4.0									
5050						(3) 3.3				
5070					(1) 3.0	(1) 2.0			(3) 2.0	
5080					(9) 2.9	(5) 3.0	(2) 2.0	(4) 2.0	(3) 3.0	

Summary: The Douglas-fir cone crop appears collectable (rating 4 or better) throughout its range in the Central Dry region. The interior spruce crop is generally light, but collectable crops were reported in the following areas: Bosk Lake (zone 5010, elev. 910-1220 m); south of Fraser Lake (zone 5050, elev. 1050 m); Fulton Lake (zone 5080, elev. 760-910 m); mile 3, Chapman Lake Road (zone 5080, elev. 910 m-1070 m); and Aiken Creek (zone 5080, elev. 610 m). Reports indicate generally good lodgepole pine cone crops in the southern part of the region (zones 5010 and 5020), but crops were very light to light in the northern zones. No reports were received for zones 5040 or 5060.

6000 SUB-BOREAL

Summary: Most cone crop rating reports received indicated collectable crops for those species and zones reported. A heavy (rating 5) Douglas-fir crop was reported in the Stuart Lake P.S.Y.U. (zone 6050, elev. 760-790 m). Heavy spruce crops were reported in the following areas: north of Summit Lake (zone 6040, elev. 910-1070 m); north of Merton Lake (zone 6040, elev. 760-910 m); Whitefish Bay (zone 6050, elev. 820 m); and near Tezzeron Lake (zone 6050; elev. 790 m). A medium crop (rating 4) of alpine fir was also reported in the Tezzeron Lake area (zone 6050, elev. 790 m). No reports were received for zones 6020, 6060, 6070, 6080, 6090 or 6100, or for lodgepole pine.

7000 BOREAL

Summary: From the few reports received, the white spruce cone crop in the Boreal region appears generally light to very light. Collectable crops (rating 4) were reported in the following areas: Peace - Clearwater (zone 7030, elev. 1100 m); Pine Pass (zone 7030, elev. 910 m); Km 522, Alaska Highway (zone 7070, elev. 430 m); Km 850, Alaska Highway (zone 7080, elev. 460 m); and Km 856, Alaska Highway (zone 7080, elev. 490 m). No reports were received for zones 7010, 7050 or 7060, or for species other than white spruce.

8000 NW PLATEAU

Summary: Only 2 reports were received for the NW Plateau region. Both were for white spruce; neither indicated a collectable crop.

B.C. SEED ORCHARDS

No.	Agency	Location	Establish Period	Area (ha)	Sp	Cone Crop Rating	No.	Agency	Location	Establish Period	Area (ha)	Sp	Cone Crop Rating
1	B.C.F.S.	Campbell R.	1963	6.6	F	3.0	11	Tahsis "C"	Saanich	1968-75	4.9	F	1.5
2	Tahsis "A"	Gold River	1962-69	2.2	F	1.5	12	Rayonier	Jordan River	1968	0.4	F	1.0
3	B.C.F.P.	Caycuse	1963-64	1.8	F	3.0	13	Rayonier	Pt. McNeill	1969	0.4	F	1.0
4	Crown Z.	Courtenay	1964-65	1.8	F	2.0	14	B.C.F.S.	Duncan	1970	4.5	F	3.0
5	Crown Z.	Nanaimo Lake	1964-65	1.8	F	2.0	15	B.C.F.S.	Campbell R.	1971	4.9	F	2.0
6	Rayonier	Gordon River	1964-65	4.1	F	1.5	16	C.F.P.	Sechelt	1971	8.2	F	1.0
7	Tahsis "B"	Gold River	1964-68	1.8	F	1.5	17	Tahsis	Gold River	1969-70	3.7	Hw	1.5
8	Tahsis Local	Gold River	1968-75	2.3	F	1.5	18	Tahsis	Saanich	1973	0.8	Ss	3.5
9	Pacific Log.	Saanich	1966	1.8	F	1.0	19	B.C.F.S.	Red Rock	1974	4.1	Pl	1.0
10	Pacific Log.	Saanich	1966	3.4	F	4.5	20	B.C.F.S.	Saanich	1975	7.4	F	1.0

Summary: The prospective cone crop in B.C. seed orchards ranges from nil to light; in several cases, the orchards are too young for a cone crop to be expected. N.B. In seed orchards, even a very light crop may be "collectable", provided that adequate pollination has occurred and viable seed are present.

YUKON TERRITORY

	White spruce			Black spruce	Lodgepole pine
Elevation Code (see p. 3)	2	3	4	3	3
Ecoregion					
Laird River		(6) 3.4	(1) 3.0		(3) 2.5
Lake Laberge	(1) 3.0	(5) 3.0			(1) 2.0
Ruby Range		(5) 2.6			
Pelly River		(5) 2.8		(1) 3.0	

Summary: Reports indicate a generally light to medium white spruce cone crop in the Yukon. Potentially collectable crops were reported in the following areas: Frances Lake and Johnsons Crossing (Laird River Ecoregion); mile 4.5, Wansen Trail and 1447 km, Alaska Highway (Lake Laberge Ecoregion); and near Mendenhall Creek (Ruby Range Ecoregion).

Acknowledgements

Most of the cone crop rating reports on which this bulletin is based were submitted by personnel of the B.C. Forest Service and the Forest Insect and Disease Survey (Canadian Forestry Service). Reports were also received from the following forest companies:

B.C. Forest Products (coastal)
Canadian Forest Products (coastal and interior)
Crown Zellerbach (coastal and interior)
Eurocan Pulp and Paper (coastal)
MacMillan-Bloedel (coastal)
Pacific Logging Co. (coastal)
Rayonier Canada (coastal)
Tahsis Co. (coastal)
Weldwood of Canada (coastal)
Weyerhaeuser Co. (interior)

Thanks are extended to the above contributors, and to any other contributors whose names may have been inadvertantly omitted.

Permit and Licence Requirements

In B.C., individuals or agencies harvesting tree cones or seeds on Crown land or on land held under licence or lease from the Crown must have a valid permit issued by the B.C. Forest Service. Permits apply to specific areas and may be obtained free of charge from the local Forest Ranger headquarters. If cones or seed are to be collected from Crown land which is under lease, permission must also be obtained from the lessee; permission of the landowner is required to collect on private land. To buy, sell or deal in tree cones and seeds, a licence must be obtained from a B.C. Forest Service District headquarters. In addition to obtaining the required permit or licence, cone collectors and seed dealers must also comply with the provisions of the Forest Act, with particular reference to the "Regulation on the Picking of Tree Cones and Tree Seeds" (B.C. Reg. 197/71); a copy may be found in "Guideline to Collecting Cones of B.C. Conifers".

For information on requirements to harvest tree cones in the Yukon Territory, consult Superintendent, Yukon Lands and Forest Service, Building 200, Takhini, Whitehorse, Y.T., Y1A 3V1 ... or one of the Territory's Regional Management offices.

Certification of Tree Seed for Export

Although most forest tree seed is collected for local reforestation, significant amounts are collected by seed dealers for export to foreign countries. This market exists because several countries, especially in western Europe, have found some western North American tree species better suited for intensive forest management than indigenous species. For example, Sitka spruce has become a valuable species in the United Kingdom, and Scandinavian countries are becoming increasingly interested in lodgepole pine.

To ensure that forest seed moving in international trade is of high quality and true to name (i.e., of the species and origin claimed) member countries of O.E.C.D. (Organization for Economic Cooperation and Development) adopted a certification scheme in 1967. Each participating country provides for the inspection of those cone collection and seed processing operations generating certified seed. The basic category recognized by O.E.C.D. is "source-identified"; requirements are that source of the seed be registered with, and verified by, a designated certifying agency, and that seeds be collected, processed, stored and shipped according to rules and regulations laid down by O.E.C.D. and the certifying agency. In addition, collections must comply with provincial or territorial regulations pertaining to forest tree seed.

In Canada, the Canadian Forestry Service is responsible for administering the O.E.C.D. scheme. The Pacific Forest Research Centre (PFRC), Victoria, is the certifying agency for export seed collected in British Columbia and the Yukon Territory. Based on field inspections and audits of company records, PFRC issues, upon request, Certificates of Provenance and O.E.C.D. shipping labels for seedlots collected and handled in compliance with the scheme.

Additional information regarding the scheme can be obtained from the Director, Pacific Forest Research Centre, Canadian Forestry Service, 506 West Burnside Road, Victoria, B.C. V8Z 1M5.

Cone Collectors' Note

As cone collection goes metric, the bushel is out–or on the way out--and the *hectolitre* is in. The changeover primarily affects calculation and record-keeping and has minimal effect on equipment and supplies. The 1.5 bushel fill line on the standard cone sack approximates 50 litres or half a hectolitre; thus two properly filled cone sacks together contain approximately 1 hectolitre of cones. However, for paying cone pickers, greater precision may be required. If so, wooden boxes of standard size should be used to verify cone volumes. A convenient-sized box, with *inside* dimensions of 25x25x40 cm, hold 25 litres when filled to the brim.

Another familiar unit on its way out is the acre. Henceforth, we will be reforesting *hectares* of cutover land, rather than acres. Hectares are about 2½ times larger than acres; to be more exact, 1 hectare equals 2.47 acres.

How many hectares can be reforested with seedlings produced from a hectolitre of cones? Of course, this varies widely from one species to another, and with seed quality and other factors. But, using averages, we find that a hectolitre of Douglas-fir or interior lodgepole pine cones should produce enough seedlings to reforest about 30-40 hectares. A hectolitre of spruce or hemlock cones goes farther, and can potentially reforest about 90-100 hectares.

Key to cones on front cover.

1 White spruce
2 Western larch
3 Tamarack
4 Douglas-fir
5 Western hemlock
6 Sitka spruce
7 Western red cedar
8 Lodgepole pine
9 Whitebark pine
10 Engelmann spruce

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